SANTEC

C-MOS COMPUTER CONTROLLED VHF/FM TRANSCEIVER MODEL ST-142

INSTRUCTION MANUAL

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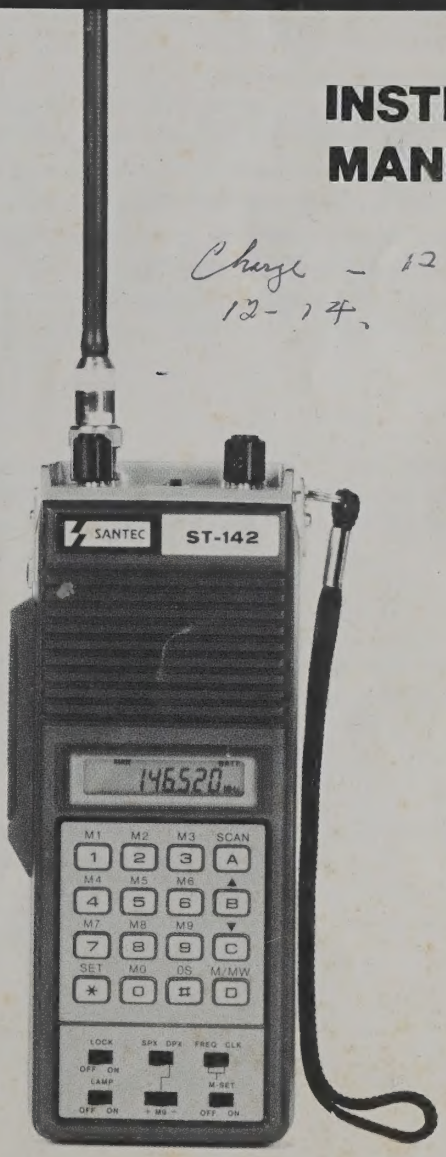
12-14.



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1. GENERAL

This handbook contains features, specifications, functional description and operating instructions for the SANTEC VHF/FM transceiver, Model ST-142. It is not, and should not be considered as, a service manual. Warranty service is available from Encomm, Inc. Demonstration of the operating characteristics is available from your dealer. In addition many dealers will help with minor service on the basis of their relationship with you the user. Factory warranty is best done, (when necessary), by sending the unit direct to Encomm, Inc under the user's name. Send your warranty registration now, as no warranty work can be done without it.

The SANTEC ST-142 transceiver is a hand-held transmitter-receiver operating in the 144-MHz amateur band using 5 kHz steps which employs a C-MOS microcomputer control and PLL synthesizer, provides excellent sensitivity, superb scanning features, 10 memories which store variable offset, as well as frequency, and more. The SANTEC ST-142 is designed with the maximum versatility available for a handheld VHF portable radio. In many cases, it can even replace the VHF mobile rig.

2. FEATURES

The SANTEC ST-142 has the following features.

A. 10-Memory locations

Easy operation is provided by using the 10 memory channels to store favorite operating frequencies and offsets to match. Due to the C-MOS computer the stored channel information is not lost when the power switch is turned off or during a battery pack exchange (when battery pack exchange has been done within 30 seconds). Both the frequency and the selected offset are stored in the memories. Each memory has the capability of storing a completely variable offset value. Only one memory needs to be committed to each receive frequency. Additional special uses are assigned to memory locations M1, M9, MØ. Bypass (SCAN lockout) can be set so that a particular memory number is skipped during all modes of MEMORY SCAN but the data in the memory is preserved. Lockout is indicated by a small "L" just to the lower right of the Memory channel number.

B. Large LCD (liquid crystal display)

The LCD display indicates the operating frequency of the transceiver in a 6 digit display. The LCD also displays keywords to indicate current operating conditions. This facilitates the confirmation of frequencies and functions which have been selected by the user. The display can be illuminated with the internal lamp.

C. 24-Hr. Clock

The ST-142 transceiver contains an accurate clock, in the 24-hour format desired for radio communications timekeeping. The clock function operates from its own frequency determining element and is unaffected by the variations in the transceivers operating frequency.

D. 16-Button-Touch Tone Generator

The ST-142 contains a full 16-(4 x 4)-button touchtone generator to produce dialing tones for repeater control, auto-patch access and telephone dialing.

E. Scanning Functions

The ST-142 provides specific scanning modes in a variety of operations as follows:

1. Band Scanning

MODE	FUNCTION	DISPLAY
Manual	Stepped by the up/down button or continuous steps.	MAN
Scanning	Programmed bandscan using MØ and last entered frequency for SCAN limits, pauses for 15 sec on each active frequency.	SCAN
Search	Search stops SCAN at the first active freq.	SRCH
Open	Programmed bandscan using MØ and the display, SCAN stops on busy channel until channel is again open for more than 3 seconds.	OPEN

2. Memory Scanning

MODE	FUNCTION	DISPLAY
Manual	Steps through the memories manually.	M MAN
Priority	Pause SCAN with CH-1 priority.	M SCAN
Search	Stops SCAN on first busy memory.	M SRCH
Open	Stops SCAN until channel is again open.	M OPEN

3. Memory SCAN Channel Bypass (Lockout)

Any memory with the exception of Memory-Ø (MØ) can be bypassed (Locked-out) during the scanning function. This is implemented by setting the M-SET switch on and pressing the "B" key while the channel is selected. This can be done manually or while the memories are scanned and SCAN has stopped on the channel. On the next pass this channel in memory will be bypassed.

F. Handheld Plus

The body of the SANTEC ST-142 is of a light weight but rugged type of injection molded plastic which is chromium plated in order to effectively radiate high output power. A wide-angle speaker and a separate condenser microphone are contained in the front section.

G. Flexible Printed Circuit

For wiring between the transmitter-receiver section and the microprocessor control section, a flexible printed circuit (FPC) is employed to avoid soldered wire connections. The use of the FPC assures the reliability of the SANTEC ST-142.

H. Hybrid IC (HIC)

Hybrid thick film technology provides high reliability through the use of advanced hybrids in the construction of the transceiver circuit boards. The ruggedness and small size of these devices aid in the rapid construction and maintenance of the ST-142.

I. Computer Current-Control-Circuit

The microprocessor in the control board detects the absence of activity at the receiver for more than 1.5 min. and shuts down the receiving circuits. Then each couple of seconds the computer turns the receiver back on long enough to detect whether or not a carrier is present. If so, it turns the receiver back to normal receive operation. If not, it shuts down again and repeats the cycle. This results in a much lower overall battery drain. A blanking of the LCD display every 1.4 seconds indicates this condition.

J. C-MOS Computer Memory Characteristics

The type of micro computer used in the ST-142 is a μPC-7503 fourbit unit with CPD, RAM and ROM all within the package. More than half the capability of the computer is used to operate the multiplexed LCD readout. When under complete operation at full operating voltage the Complementary-Metal-Over-Silicon Field-Effect Transistor (C-MOS) technology allows the computer to consume less than one half miliAmpere of current. When the power to the main body of the radio is turned off the processor shuts down all but the most necessary functions. In this condition it requires only 100 micro-Amperes of current to maintain the memories and keep the time on the clock correctly. When the unit is turned on again, the processor will remember where it was with respect to the scan mode, memory or band functions and what the last operating frequency was and restore itself to that condition and await your commands.

3. SPECIFICATIONS

A. General

Semiconductors used	Transistor .... 21 each FET ..... 5 each IC ..... 26 each Diode ..... 39 each
Frequency Range	142.000 to 149.995 MHz for TX/RX
Type of Emission	F3
Number of Channels	1600 (5 kHz-step) for TX 1600 (5 kHz-step) for RX
Memory Channels	10 Channels
Antenna Impedance	50 Ohms
Power Source	9.6 VDC nickel cadmium battery pack, 8 "AA" cells welded 8N500AAF
DC Power Used	35 mA for squelch RX 12 mA computer controlled RX current 150 mA for receiving with max audio 1.0 A for transmitting (H) 550 mA for transmitting (M) 300 mA for transmitting (L) (Note: Above currents are approximate values.)
Dimensions	68mm (W) x 17mm (H) x 47mm (D)
Weight	650 grams

B. Transmitter Section

RF Output Power	3.5W (H), nominal at 10.5V 1.0W (M), nominal at 10.5V 0.1W (L), nominal at 10.5V
Modulation	Frequency modulation
Maximum Frequency	Deviation ±5 kHz
Transmit Spurious	Less than −50db
Type of Microphone	Condenser microphone

C. Receiver Section

Receiving Methods	Double superheterodyne
I. F. Frequency	16.9 MHz, 1st IF 455 kHz, 2nd IF
Receive Sensitivity	12db Sinad, less than 0.35 μV
Squelch Sensitivity	Less than 0.35 μV
Band Width	±7.5 kHz at 6db down
Selectivity	±15 kHz at 60db down

NOTE: The specifications and circuitry may be changed for engineering development and quality improvements without notice or obligation.

4. ACCESSORIES

The following materials are supplied along with the SANTEC transceiver, Model ST-142.

a.	9.6V nickel-cadmium battery pack	1
b.	Battery Charger (45mA)	1
c.	Earphone	1
d.	Hand Strap	1
e.	Flexible helical antenna with BNC	1
f.	Instruction Manual	1 copy

5. CAUTIONS TO USERS – CAUTION – CAUTION TO USERS

1. Please, Charge the battery before using.
2. In order to avoid damage to the ST-142, don't operate the transceiver without the use of the antenna.
3. Don't expose the ST-142 to intense, direct sunshine, SUCH AS THE DASH OF A CAR IN SUMMER. Also, avoid subjecting it to temperatures over 50 degrees centigrade or high humidity. Never immerse in water.
4. Before loading or unloading the battery, turn off the power.
5. If you find a situation in which your microprocessor is confused or is giving strange results to your key commands, please do the following to reset the processor on the right track.
    1. Turn off the power switch
    2. Pull the plug on the battery out of the radio
    3. Wait (3-5 min)
    4. Reconnect a fully charged battery to radio and reprogram the memories.
6. Don't overcharge your battery pack by putting it on an unlimited current charge or power supply. Manufacturers recommendations are to limit the current to the pack to 150 mA for not more than 6.5 hrs. or not more than 100 mA for more than 72 hrs.
7. DO peel off the protective film on the keyboard and switch panels. They will bubble and look bad if you don't.
8. DO NOT SHORT "QUICK CHARGE" connection to ground as it will either blow the fuse (L-25) or smoke a wire.
9. DO NOT TRANSMIT WHILE ON THE ST-WC WALL CHARGER as a hum will result and transient voltages from the charger might damage the transmitter. Transmitting on the ST-MC mobil charger is usually OK.
10. If the frequency of the display reverts to the Memory-1 frequency without any apparent reason, watch the PLL Alarm indicator to make certain that a frequency outside the lock range of the synthesizer has not been programmed. If the unit looses lock for more than 10 seconds it will replace the impossible frequency with Memory-1 and try to lock again. If the bad frequency is in Memory-1 it will loop on itself forever and show an essentially blank screen.

DO NOT REPLACE THE LAMP DEVICE IN THE ST-MC WITH A FUSE.

NO MATTER WHAT THE VOLTAGE IS, FOLLOW THIS RULE:
DO NOT PLUG DIRECTLY INTO 12 VOLT CAR SYSTEM!
NICADS REQUIRE CONSTANT CURRENT CHARGING
LIMITED TO A SAFE VALUE !!!

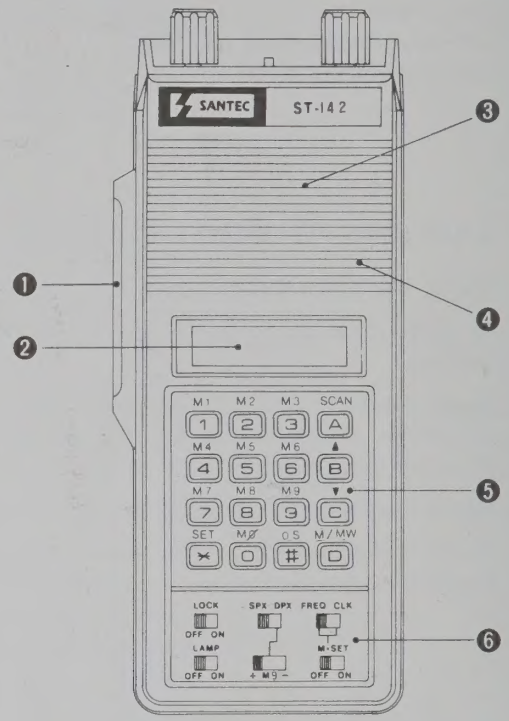
6. DESCRIPTION OF CONTROLS

A. Front Panel Description

The SANTEC transceiver, Model ST-142 front panel is illustrated below. Liquid Crystal Display (LCD).

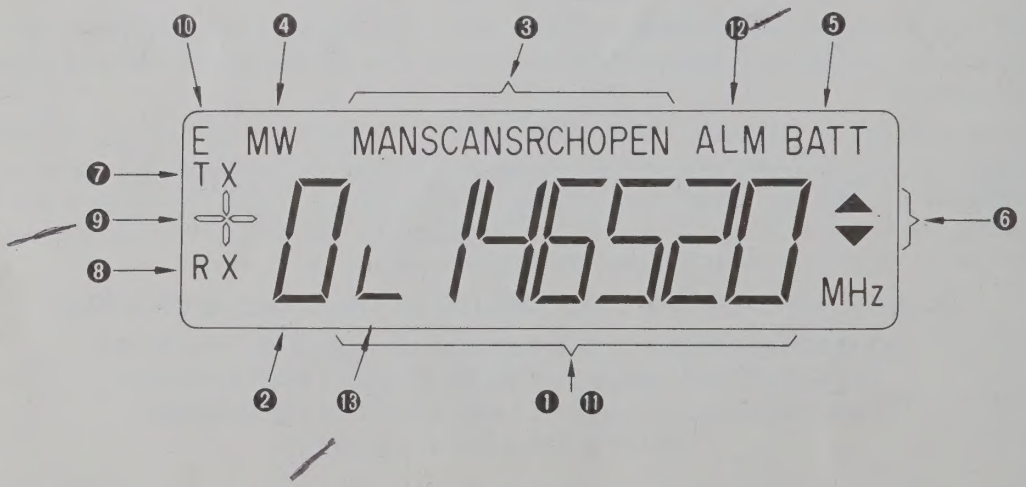
A. Liquid Crystal Display (LCD).

1. PTT Switch
2. LCD
3. Speaker
4. Condenser Microphone
5. 16-Key Keyboard
6. Slide Switch Board



The following is displayed on the LCD.

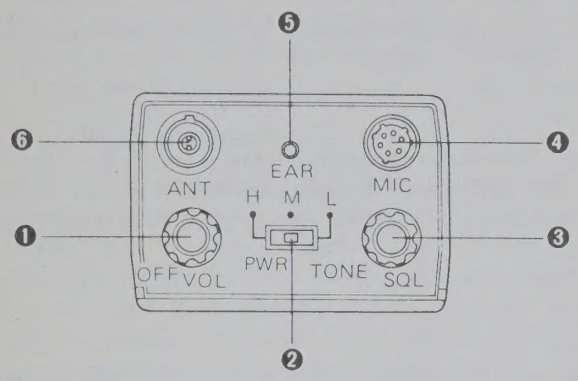
1. Frequency (frequency or memory mode)
2. Memory Channel (memory mode)
3. Scanning Mode
4. Memory Mode (memory read and memory write)
5. Battery Alarm (Blinks when Battery Low otherwise off.)
6. Up/Down Arrows
7. TX
8. RX
9. SPX ( )/DPX (+ or –)/Mem–9 (1)
10. Error
11. Time (available by setting the slide switch)
12. PLL Alarm (Out of lock indicator)
13. Scan Lockout (memory mode)



B. Controls and Connectors

1. Top of Body

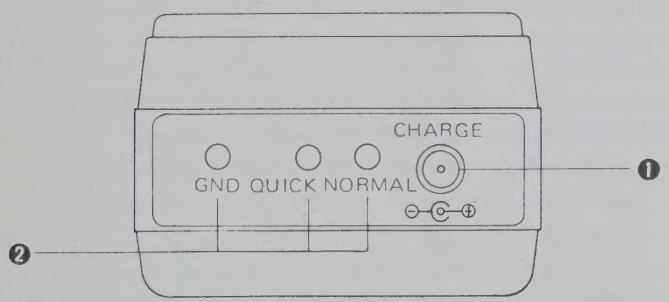
The controls and connectors provided at the top of the body are as follows:



1. ON-OFF Power and Sound-Volume Control
2. Transmit power switch H (high), M (middle) and L (low)
3. Squelch-adjust and tone-squelch decoder power switch
4. External speaker/microphone jack
5. Earphone jack
6. BNC antenna connector

2. Bottom of Body

The following connectors are provided on the bottom of the body.



1. Jack for external charger, wall or mobile type.
2. Terminals for quick charger.
3. Terminal for normal charger.
4. Ground terminal

C. Description of 16-Key board

The functional description of the 16-Key board is as follows:

1. Receiving

M1 M2 M0
[1] [2] ... [0] Number Keys

These keys are used to assign a frequency or memory frequency as required and to access the memory.

SET
[×] Setting Key

This is used to set the selected frequency. The frequency set by this key is displayed on the LCD. When an illegal frequency is set by the key, the entered frequency disappears and an "E" letter appears on the LCD. In this case, the previously set frequency appears again by depressing any of the number keys.

SCAN
[A] Scan-Mode Selector

1. Change of Scanning Mode
By depressing this key, selection of the four modes MAN, SCAN, SRCH, and OPEN is made in sequence. One step with every depression of the key and simultaneously the new mode is displayed on the LCD.

2. Setting the Step Size
The transceiver is designed to initialize with a 15 kHz step size. By using the **SCAN/**[A] key, steps of 5, 10, 15, up to 100 kHz in 5's can be set by the user under keyboard control.

[B] Up Key and BYPASS (Lockout)

1. When this key is depressed, scanning starts toward a frequency higher than the frequency displayed on the LCD. Scan continues until the frequency stored in memory "Ø" is reached. If the value stored in memory "Ø" is lower than the value in the start position, the SCAN will not function, but will simply flash the LCD. So remember, the top of the SCAN limit (i.e. the highest frequency you want to SCAN) must be in "MØ" and the bottom of the band (or lowest frequency) must be set in the display.

2. In memory mode, scanning starts toward the next higher numbered memory channel, scanning to the next higher channel until all the channels have been scanned. In "SCAN", if a busy channel is encountered, SCAN will recheck channel "1" after a 5 second delay to see if channel "1" is busy. If channel "1" is not busy, then the next channel scanned is the previous busy channel + 1. If channel "1" is busy, then the SCAN is suspended until the signal on channel "1" is gone. Scan then resumes on the channel which was next in line before it left the sequence to check channel "1".

3. Additionally the [B] key is used while the M-SET switch is "ON" to Bypass (Lockout) selected memories without disturbing the data stored in them. Any memory or all memories except memory-Ø can be bypassed. If bypass is attempted on MØ the command is ignored. Also while the M-SET is on memory SCAN is possible in the down direction only.

[C] Down Key

1. When this key is depressed band scanning starts down from the frequency displayed on the LCD. Scan will continue until the bottom edge of the band is reached. It will then return to the starting point and resume SCAN downward from there. NOTE: The band limit stored in memory "Ø" is only effective on SCAN in the up direction.

2. In memory mode, scanning starts toward the next lower numbered memory and continues downward in the same manner as the up SCAN. The only difference is the channels are scanned in reverse order.

M / MW [D]

Memory/Memory Write Key

By depressing this key change is made to the memory mode or the band mode. Simultaneously the LCD displays an "M" letter for memory mode. The "M" letter disappears when band mode is entered again by pressing the key. When this key is depressed and the M-SET slide switch is switched to "ON", the function is toggled between the "MW" (write to the memory selected by the next key) and the band mode. In the MW mode data for each memory is stored at the desired location. As soon as a Memory location is loaded the operation automatically reverts to the memory recall mode. This prevents undesired overwriting of previously stored memories.

OS [#]

Offset Recall and Store Key

Each memory can have individually programmable, variable value, offset capability. The offset is examined by pressing the Memory recall and then pressing the [#] key. To write to the offset register turn on the M-SET switch, key in the value of the offset in 10 kHz steps, up to 9990 kHz, and press the [#] key (The resulting frequency must be within the range set by the PROM). Store the data back to the memory and the offset for that memory and the dial have been changed. To put the standard offset back in the dial, key 600 [#] or enter a new frequency. If an offset which is not on 10 kHz spacing is used, the M-9 transmit method must be used. See para 7-3(3) for more explanation.

2. Transmit

All Keys

All of the 16 keys are used to select DTMF TONES in transmit.

3. Clock

[1] [2] · · · [0] Number Keys

After switching M-SET on, time is entered in 24-hour format from 0000 to 2359 indicating "'hour" and "minute". Seconds are displayed automatically. During the upcoming 55-59 second portion of the minute, key in the correct hour and minute using the normal 0 thru 9 keys. Use military time, i.e. 0800 hrs., 1700 hrs., etc. The clock function will reset the seconds to zero automatically when the set button is pushed. The clock will only wait 5 seconds before showing error. This means that the correct time must be completely entered during the last 5 seconds of the minute preceding the desired minute.

Example: [0] [8] [2] [5] [×] will set 825 am into the clock.

SET [×] Setting Key

The time is set by pressing this key and the LCD displays the time. When a miss entry is made, the LCD displays "E". In this case, the previous time is displayed by depressing any of the 16 keys.

D. Description of Slide Switches

1. Freq-Clk switch

When the FREQ and M-SET OFF positions are selected, frequency setting (LCD displays the set frequency), band scanning and scanning step frequency setting are possible. In the memory mode, access to memory stored frequencies is available.

If the CLK mode is set while the radio is otherwise on, the LCD indicates time. However, even under these conditions some operation is possible (with the power switch turned ON). When CLK and M-SET are both ON: Time setting can be done using the digits and the set buttons. If the radio is switched off while the clock mode is set, the PLL out of lock timer continues to run and when the radio is switched on the alarm program will fetch the frequency of Memory-1. This occurs only if the clock mode was set before the radio was switched off.

2. SPX-DPX switch

When SPX position is set, the transmitting frequency is the same as the receiving frequency. This is only valid in the band mode with reference to the positions of the slide switches (+, –, M9, SPX). In the memory mode, recalled memories carry their own information as to the offset and take precedence over the position of this switch and the DPX selector switch.

3. DPX selector switch

When duplex, either + or – positions is set, the transmitting frequency is shifted to the frequency stored in ROM or RAM memory appropriate to the setting of the switches. When the DPX, M9 position is set, the transmitting frequency is shifted to the frequency stored in Memory-9.

4. LOCK switch

If the LOCK ON position is set: The buttons (all 16 keys) are locked and no keyboard operation is possible except the operation of DTMF tones during transmitting.

5. LAMP switch

During the time the LAMP ON position is selected, the lamp lights to make the LCD display more visible in low light levels.

7. OPERATING PROCEDURES

7-1. Initial Installation and Start-up

A. Battery pack:

To install the battery pack, remove the back cover of the transceiver using a coin. Insert the battery pack jack into the 3-pin plug on the right side (NOTE: Observe the correct orientation of the plug). Replace the back cover and proceed.

B. Power Turn-on:

Set the slide switch to FREQ and turn the power switch on. The LCD then displays "MAN" and 146.520 MHz. This shows that the frequency 146.520 MHz has been set at the moment of initial power-on. The display may also indicate a duplex direction if the SPX-DPX switch is in DPX.

C. CLK function:

Set the slide switch to CLK. The clock started to count time from 00:00 at the moment the battery pack was installed. To set the clock, turn on M-SET. Key in 4 digits of the time 5 seconds before the minute. Press the key at the exact minute. If you wait more than 5 seconds the display blanks and indicates the "E" error and you must touch the key and begin again. That's why this is all done in the 5 seconds before the minute.

7-2. Frequency Assignment

A. Entry of Desired Frequency:

Enter the frequency desired by dropping the "14" from the frequency and entering the balance of the numbers in sequence. The LCD displays the data with every keystroke, but the kHz digit can display as 0 or 5 only. (If data other than 0 or 5 is entered into the last digit, an error will result and the display will blank all the digits and the "E" will appear). To lock in the entered data, depress key [×] within 5 seconds. 140 MHz is added to the entered frequency, obtaining the display of the desired frequency.
Example: 147.060 is [7] [0] [6] [×]

B. Omission of Trailing "0"

When only 0's remain in the frequency, such as 0. 00, or 000, you may skip entering the remainder of the number. For example, the three zeros (000) of 147.000 MHz. To enter, depress key 7 and then depress [×] . 147 MHz is set in only 2 key strokes.

C.

Please note that if you enter ALL THE DIGITS OF 147.060 as the data the ST-142 C-MOS computer will accept it. Therefore you can leave out the first two numbers and the trailing zeros or you can enter the entire number. **BUT YOU CAN NOT MIX THE PROCEDURES !!**

D. Correction of Bad Data Set:

The LCD displays "E" for incorrect frequency setting. In such cases, depress any of the number keys and the LCD displays the previously set frequencies. Repeat step 7-2, (a) above. False frequency setting is due to the entry of erroneous data as follows: (1) Setting of a frequency other than a 5 kHz spaced channel. (2) The set / [×] key was not depressed within 5 seconds after the number keys. (3) Entry of a frequency outside the range set by the ROM.

7-3. Repeater Offset

Set the SPX/DPX slide switch to the DPX position. The LCD displays the symbols +, I, or — according to the set position of the "+, M9, —" slide switch. In these conditions, offset is done as follows:

(1) With the slide switch positioned to + (or —) and the LCD display of + (or —), the frequency 0.6 MHz higher (lower) than the received frequency is transmitted.

NOTE: When the resultant frequency is outside of the range of 142.000 MHz to 149.995 MHz, the LCD indicates "E" and no signal is transmitted.

(2) TO PROGRAM AN OFFSET OTHER THAN 0.6 MHz DO THE FOLLOWING:
Program the RECEIVE frequency to be used into the unit as a duplex frequency with the offset direction set. Use the +/—/M9 switch located below the SPX/DPX switch to set this direction. Turn on the M-SET switch. The desired offset is now entered as the value of the offset in kHz with a 10 kHz multiple. This value is then stored by pressing the [#] key with the M-SET switch on. Turn off the M-SET switch when finished. When a new frequency is entered the offset automatically reverts to 600 kHz.

(3) TO PROGRAM AN OFFSET NOT ON 10 KHZ SPACING, DO THE FOLLOWING:
Program the frequency to be used for TRANSMIT in to the dial and using the memory store procedure, store it in Memory-9 as a simplex frequency. Next program the frequency to be used for RECEIVE into the dial. Now set the SPX/DPX switch and the +/M-9/— switch to DPX and M-9. As the PTT switch is pressed the transmitter will go to the frequency stored in Memory-9. These can be different by any amount from one channel to the entire band. The receive frequency and the M-9 offset can be stored in a memory (other than M-9) if desired.

7-4. Memory Channel Frequency and Variable Offset Storage

When the battery is first installed, 146.520 is set in every memory channel from M1 to M9 and 149.995 MHz is stored in MØ automatically. The LCD, therefore, displays 146.520 MHz, showing that 146.520 MHz (stored in M1) is set automatically at the moment of initial power-up or battery installation.

A. Frequency Memory with Offsets

(1) Set the frequency to be stored including offset.

(2) Turn the M-SET slide switch on.

(3) Depress key **M/MW** ▣ once and confirm that the LCD display "MW" is on.

(4) Depress one number key (Memory address keys of M1 to M0). The set frequency is stored in the microprocessor. The "MW" changes to "M" to prevent accidental overwriting.

(5) Touch the **M/MW** ▣ key to re-enter the frequency mode. Set the next frequency and repeat from (3). Turn the M-SET slide switch off when entering is completed.

NOTE: (1) When the M-SET slide switch is not ON, the above memory write mode is not obtained by depressing key **M/MW** ▣ only the "M" appears and disappears indicating the Memory mode is toggled on and off ..... (2) When the memory address key M0 is used, the band scanning stops at the value of M0 because the upper limit frequency is the value of M0.

B. Reading the Memories

While the M-SET Switch is "OFF"

(1) Depress key **M/MW** ▣ once and confirm that the LCD displays "M" (memory mode).

(2) Depress one of the memory channels M1 to M0. The frequency is read out including offset and memory channel number.

(3) Depress **M/MW** ▣ again. The "M" on the LCD disappears, showing that the memory mode is shifted to the band mode.

C. Shifting Memory Frequencies between Addresses

For example, when it is desired to shift memory M2 to memory M3:

(1) Depress **M/MW** ▣ (go to memory mode).

(2) Depress M2 (recall the frequency to move). Set the proper Duplex Mode and Direction.

(3) Turn the M-SET slide switch on, and then depress **M/MW** ▣ twice. (memory-write mode). Confirm that "MW" is displayed.

(4) Depress M3 (to put the data into M3).

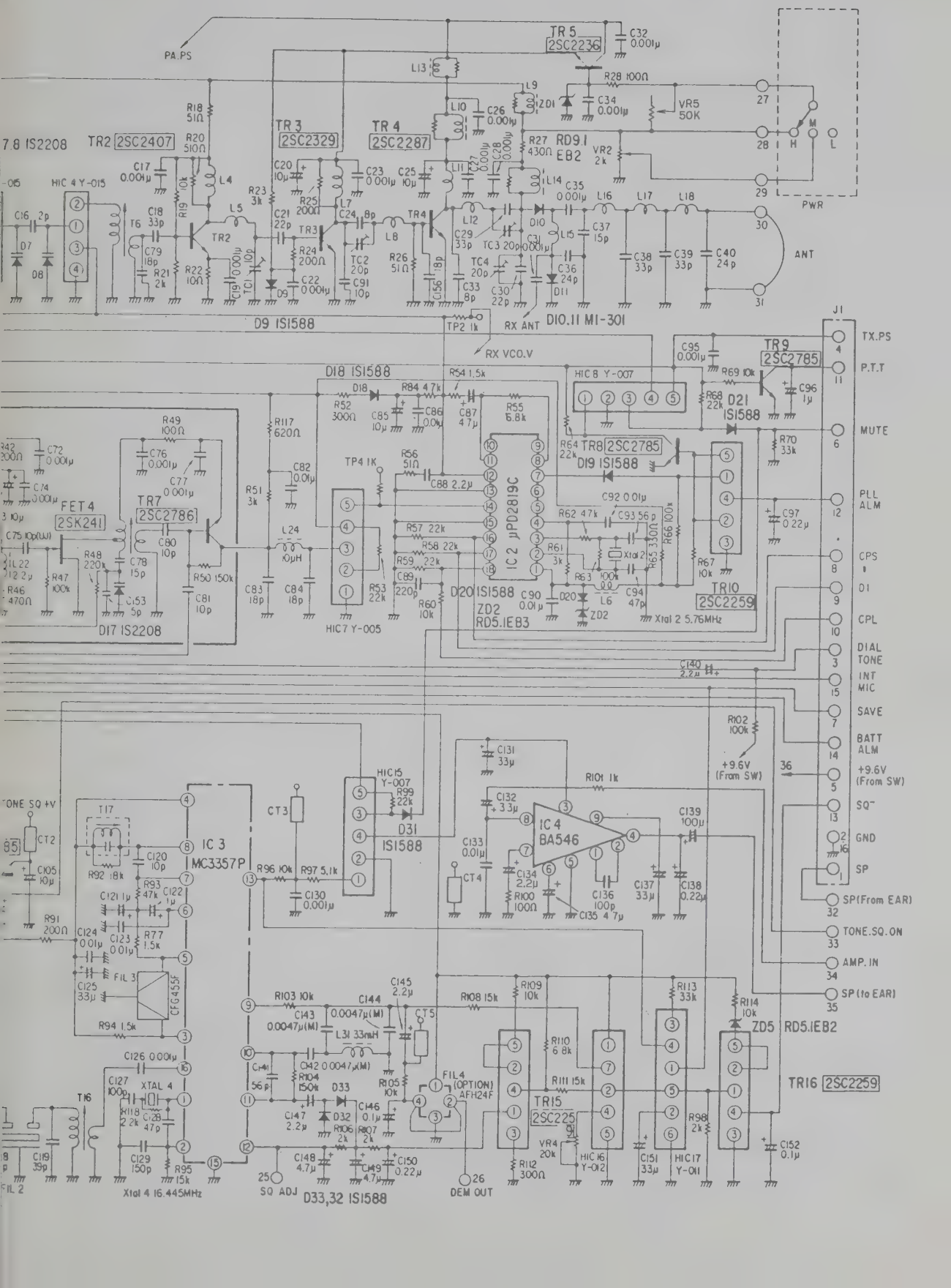
(5) Turn off the M-SET switch or repeat from step (2).

7-5. Band Mode Scanning

A. Select a Scanning Mode:

To select one of the four scanning modes of MAN, SCAN, SRCH or OPEN, press **SCAN** ▣ key repeatedly while observing the LCD display. The LCD display shows MAN, SCAN, SRCH, OPEN, MAN in repeated order each time the SCAN ▣ key is pressed.

TIC DIAGRAM


PA.PS
TR5 2SC2236
TR3 2SC2329
TR4 2SC2287
TR2 2SC2407
RD9.1 EB2
VR5 50K
VR2 2k
PWR
ANT
HIC 4 Y-015
D9 IS1588
D10.11 MI-301
RX ANT
TP2 1k
RX VCO.V
D18 IS1588
HIC 8 Y-007
TR9 2SC2785
TR8 2SC2785
D21 IS1588
D19 IS1588
IC 2 μPD2819C
FET 4 2SK241
TR7 2SC2786
TR10 2SC2259
D17 IS2208
HIC7 Y-005
Xtal 2 5.76MHz
ZD2 RD5.1EB3
J1
TX.PS
P.T.T
MUTE
PLL ALM
CPS
DI
CPL
DIAL TONE
INT MIC
SAVE
BATT ALM
+9.6V (From SW)
SQ⁻
GND
SP
SP(From EAR)
TONE.SQ.ON
AMP.IN
SP(to EAR)
IC 3 MC3357P
IC 4 BA546
HIC15 Y-007
D31 IS1588
FIL 3 CFG455F
FIL 4 (OPTION) AFH24F
TR15 2SC2253
TR16 2SC2259
ZD5 RD5.1EB2
HIC16 Y-012
HIC17 Y-011
Xtal 4 16.445MHz
SQ ADJ
DEM OUT
D33,32 IS1588

7-4. Memory Channel Frequency and Variable Offset Storage

When the battery is first installed, 146.520 is set in every memory channel from M1 to M9 and 149.995 MHz is stored in MØ automatically. The LCD, therefore, displays 146.520 MHz, showing that 146.520 MHz (stored in M1) is set automatically at the moment of initial power-up or battery installation.

A. Frequency Memory with Offsets

(1) Set the frequency to be stored including offset.

(2) Turn the M-SET slide switch on.

(3) Depress key **M/MW** [D] once and confirm that the LCD display "MW" is on.

(4) Depress one number key (Memory address keys of M1 to M0). The set frequency is stored in the microprocessor. The "MW" changes to "M" to prevent accidental overwriting.

(5) Touch the **M/MW** [D] key to re-enter the frequency mode. Set the next frequency and repeat from (3). Turn the M-SET slide switch off when entering is completed.

NOTE: (1) When the M-SET slide switch is not ON, the above memory write mode is not obtained by depressing key **M/MW** [D] only the "M" appears and disappears indicating the Memory mode is toggled on and off ..... (2) When the memory address key M0 is used, the band scanning stops at the value of M0 because the upper limit frequency is the value of M0.

B. Reading the Memories

While the M-SET Switch is "OFF"

(1) Depress key **M/MW** [D] once and confirm that the LCD displays "M" (memory mode).

(2) Depress one of the memory channels M1 to M0. The frequency is read out including offset and memory channel number.

(3) Depress **M/MW** [D] again. The "M" on the LCD disappears, showing that the memory mode is shifted to the band mode.

C. Shifting Memory Frequencies between Addresses

For example, when it is desired to shift memory M2 to memory M3:

(1) Depress **M/MW** [D] (go to memory mode).

(2) Depress M2 (recall the frequency to move). Set the proper Duplex Mode and Direction.

(3) Turn the M-SET slide switch on, and then depress **M/MW** [D] twice. (memory-write mode). Confirm that "MW" is displayed.

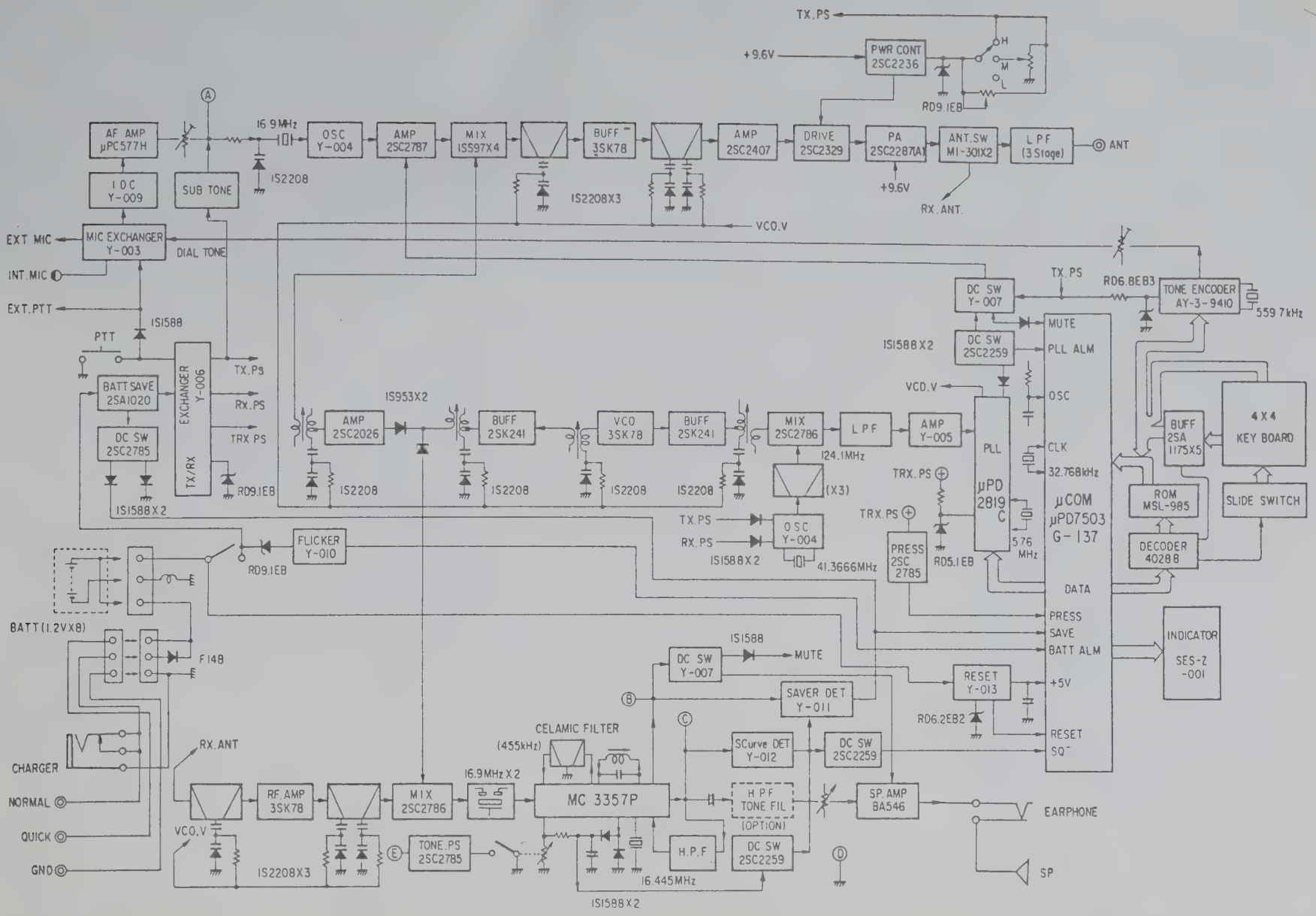
(4) Depress M3 (to put the data into M3).

(5) Turn off the M-SET switch or repeat from step (2).

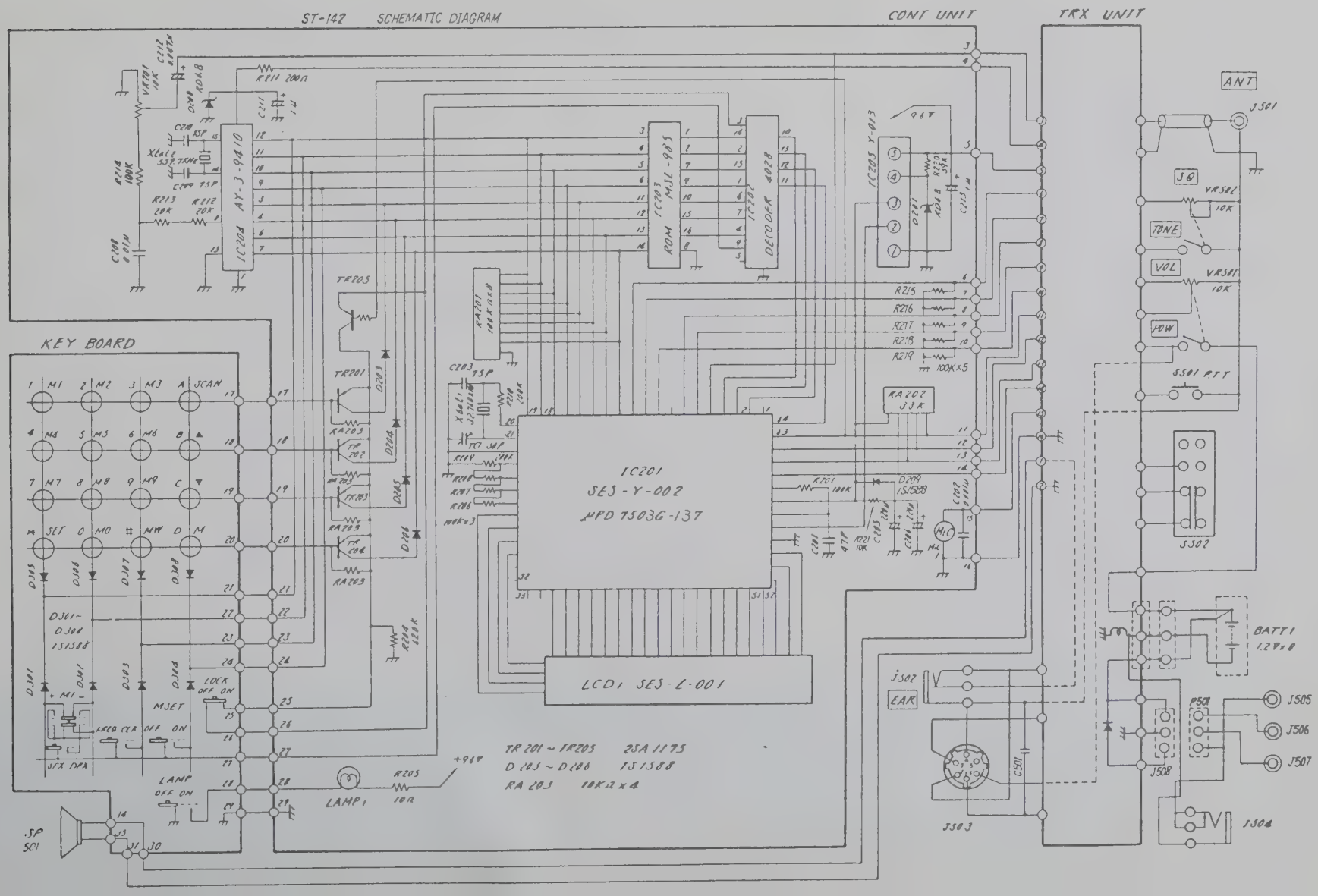
7-5. Band Mode Scanning

A. Select a Scanning Mode:

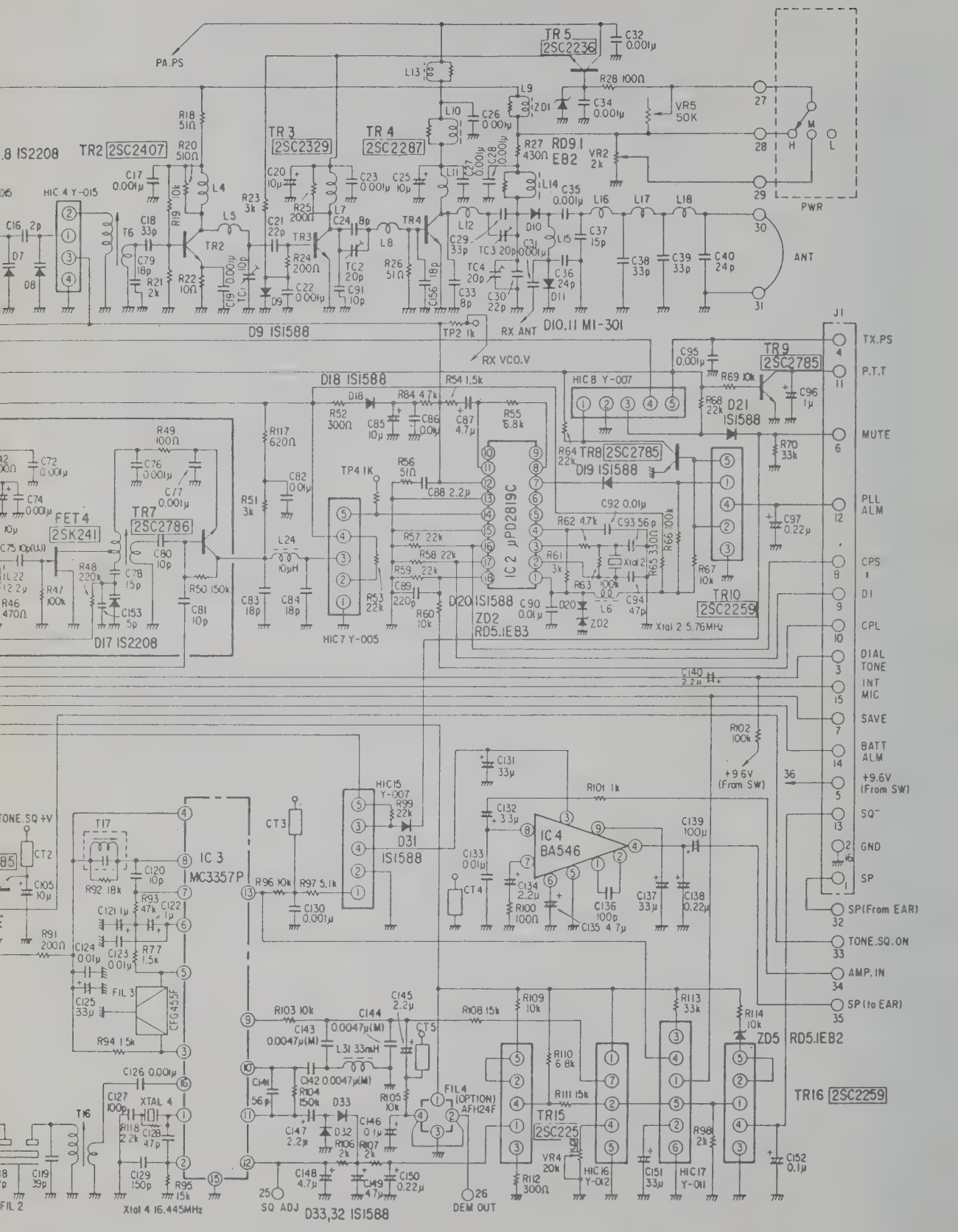
To select one of the four scanning modes of MAN, SCAN, SRCH or OPEN, press **SCAN** [A] key repeatedly while observing the LCD display. The LCD display shows MAN, SCAN, SRCH, OPEN, MAN in repeated order each time the SCAN [A] key is pressed.



ST-142 BLOCK DIAGRAM



TIC DIAGRAM


PA.PS
TR5 2SC2236
TR3 2SC2329
TR4 2SC2287
TR2 2SC2407
RD9.1 EB2
VR5 50K
VR2 2k
PWR
ANT
HIC 4 Y-015
D9 IS1588
TP2 1k
RX ANT
DIO.11 MI-301
RX VCO.V
D18 IS1588
HIC 8 Y-007
TR9 2SC2785
TR8 2SC2785
D19 IS1588
D21 IS1588
FET4 2SK241
TR7 2SC2786
D17 IS2208
TP4 1K
HIC7 Y-005
IC 2 μPD2819C
D20 IS1588
ZD2 RD5.1EB3
TR10 2SC2259
Xtal 2 5.76MHz
J1
TX.PS
P.T.T
MUTE
PLL ALM
CPS
DI
CPL
DIAL TONE
INT MIC
SAVE
BATT ALM
+9.6V (From SW)
SQ⁻
GND
SP
SP(From EAR)
TONE.SQ.ON
AMP.IN
SP(to EAR)
IC 3 MC3357P
IC 4 BA546
HIC15 Y-007
D31 IS1588
CT3
CT4
CT5
FIL 3
CFG455F
FIL 4 (OPTION) AFH24F
ZD5 RD5.1EB2
TR16 2SC2259
TR15 2SC225
HIC16 Y-012
HIC17 Y-011
Xtal 4 16.445MHz
SQ ADJ
D33,32 IS1588
DEM OUT

B. MAN Scanning

When initial power is first turned on, the MAN (manual) scanning mode is automatically assumed. By depressing key [B] or [C], stepping starts at intervals of SCAN step. If the button is held down for about one second the stepping begins continuously. To stop the scanning, depress [B] or [C] again. (Increase in frequency occurs with every depression of [B] and decreases in every depression of [C] in step selected by the SCAN step procedure.

C. SCAN Mode

To enter the automatic scanning mode, depress **SCAN/** [A], and confirm that SCAN shows in the LCD then press [B] or [C] to begin scanning in either the up or down direction. The scanning stops from a period of 15 seconds when receiving a signal and then the SCANning begins again. If the signal disappears during the 15 seconds, the scanning resumes three seconds after the signal disappears.

D. SRCH Mode

To enter the SRCH search mode, depress **SCAN/** [A] until SRCH appears in the LCD display. Then press either [B] or [C]. The scanning stops when a signal is received. When the signal disappears, the SCAN does not resume until [B] or [C] is depressed again to start.

E. OPEN Mode

Depress key **SCAN/** [A] for the OPEN mode. When a signal is received, the scanning stops until the received frequency disappears for more than 3 seconds, SCAN will then resume provided [B] or [C] or the PTT is not depressed.

F. Scanning Step Size Change

To change the scanning step size to 5 kHz, 10 kHz up to 100 kHz steps, depress the number keys and then the **SCAN/** [A] key. Example: (1) Depress 1, 5, and SCAN/A. for scanning at intervals of 15 kHz. Numbers must be in integer multiples of 5's.

G. Limits of Scanning Frequency

(1) The upper limit of scanning is the frequency in memory address M0, i.e., 149.995 MHz (loaded at power turn-on). When you depress [B] scanning is started toward the M0 address frequency from the present dial frequency, which must be lower than M0.

(2) The lower limit of scanning is 142.000 MHz. Depress [C] after the setting of a frequency, and the SCAN will begin in a downward direction until the lower limit frequency of 142.000 is reached.

Example: If scanning the range of 144.000 kHz to 146.000 kHz in 20 kHz steps is desired:

(1) Set 146.000 MHz, [6], [×] move the M-SET slide switch on and depress **M/MW** and M0 to write to address M0.

(2) Depress **M/MW** [D] again to release the memory write, and then turn the M-SET slide switch off.

(3) Depress [2], [0], and **SCAN** [A] to set 20 kHz steps. DO NOT SET A STEP SIZE OF "OKHZ"

(4) Set 144.000 MHz. [4], [×].

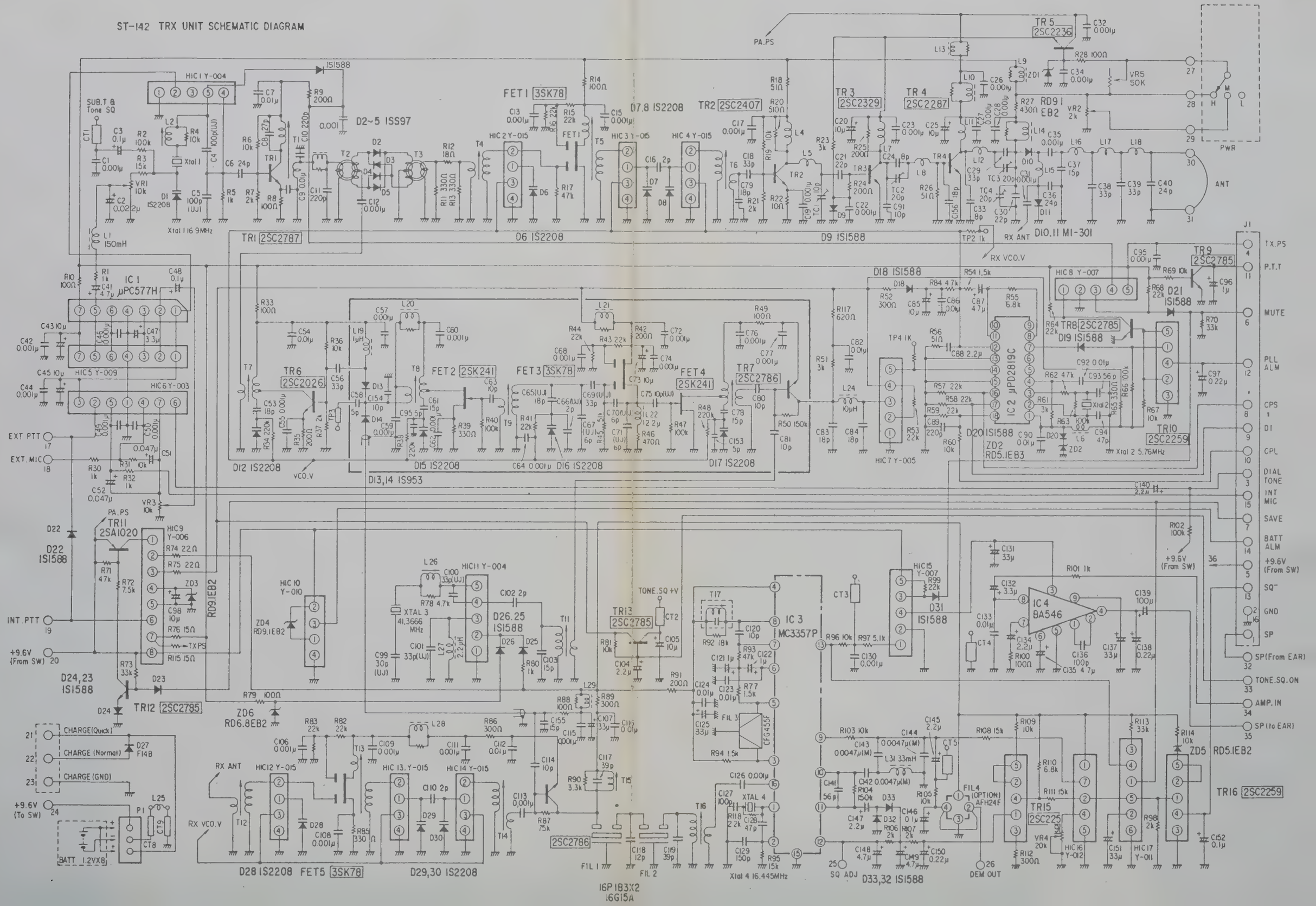
(5) Select the scanning mode required and depress [B]. You are now scanning in the range of 144-146 MHz.

NOTES: (1) It is recommended that a limit frequency be set which is divisible by the desired step size by an integer amount.

(2) If the start frequency is higher than the M0 address frequency, IT DOES NOT SCAN IN THE UP DIRECTION from that frequency. The LCD just blinks.

ST-142 SCHEMATIC DIAGRAM

ST-142 TRX UNIT SCHEMATIC DIAGRAM



B. MAN Scanning

When initial power is first turned on, the MAN (manual) scanning mode is automatically assumed. By depressing key [B] or [C], stepping starts at intervals of SCAN step. If the button is held down for about one second the stepping begins continuously. To stop the scanning, depress [B] or [C] again. (Increase in frequency occurs with every depression of [B] and decreases in every depression of [C] in step selected by the SCAN step procedure.

C. SCAN Mode

To enter the automatic scanning mode, depress **SCAN/** [A], and confirm that SCAN shows in the LCD then press [B] or [C] to begin scanning in either the up or down direction. The scanning stops from a period of 15 seconds when receiving a signal and then the SCANning begins again. If the signal disappears during the 15 seconds, the scanning resumes three seconds after the signal disappears.

D. SRCH Mode

To enter the SRCH search mode, depress **SCAN/** [A] until SRCH appears in the LCD display. Then press either [B] or [C] The scanning stops when a signal is received. When the signal disappears, the SCAN does not resume until [B] or [C] is depressed again to start.

E. OPEN Mode

Depress key **SCAN/** [A] for the OPEN mode. When a signal is received, the scanning stops until the received frequency disappears for more than 3 seconds, SCAN will then resume provided [B] or [C] or the PTT is not depressed.

F. Scanning Step Size Change

To change the scanning step size to 5 kHz, 10 kHz up to 100 kHz steps, depress the number keys and then the **SCAN/** [A] key. Example: (1) Depress 1, 5, and SCAN/A. for scanning at intervals of 15 kHz. Numbers must be in integer multiples of 5's.

G. Limits of Scanning Frequency

(1) The upper limit of scanning is the frequency in memory address M0, i.e., 149.995 MHz (loaded at power turn-on). When you depress [B] scanning is started toward the M0 address frequency from the present dial frequency, which must be lower than M0.

(2) The lower limit of scanning is 142.000 MHz. Depress [C] after the setting of a frequency, and the SCAN will begin in a downward direction until the lower limit frequency of 142.000 is reached.

Example: If scanning the range of 144.000 kHz to 146.000 kHz in 20 kHz steps is desired:

(1) Set 146.000 MHz, [6] , [×] move the M-SET slide switch on and depress **M/MW** and M0 to write to address M0.

(2) Depress **M/MW** [D] again to release the memory write, and then turn the M-SET slide switch off.

(3) Depress [2] , [0] , and **SCAN** [A] to set 20 kHz steps. DO NOT SET A STEP SIZE OF "0KHZ"

(4) Set 144.000 MHz. [4] , [×] .

(5) Select the scanning mode required and depress [B] . You are now scanning in the range of 144-146 MHz.

NOTES: (1) It is recommended that a limit frequency be set which is divisible by the desired step size by an integer amount.

(2) If the start frequency is higher than the M0 address frequency, IT DOES NOT SCAN IN THE UP DIRECTION from that frequency. The LCD just blinks.

7-6. Memory Mode Scanning

The memory mode is entered by depressing **M/MW** [D] . The LCD displays "M". In the memory mode, the procedures A, B, D and E of Band Mode Scanning are identical with exception of the SCAN mode (priority scanning) which is a special case.

SCAN MODE (priority scanning)

Depress **SCAN** [A] and **M/MW** [D] to enter the memory scanning mode by oberving the M and SCAN indications on the LCD. Then depress [B] or [C] and the LCD indicates M, SCAN, and the UP or DN arrow indicators. While a signal is received on M3 the SCAN is suspended, but scanning returns to M1 about 5 seconds after receipt of a signal even if the M3 memory frequency is still being received. If the M1 frequency is not received, the scanning returns to M4 to begin SCAN again. However, when the M1 frequency is busy the SCAN stops for as long as M1 is busy. When M1 disappears, the scanning goes to M4 (M3 + 1) after 3 seconds from the moment the M1 signal disappears.

7-7. Telephone Dialing Tones

While the PTT switch is pushed, DTMF tones are transmitted from each of the 16 keys on the keyboard. These are the standard telephone DTMF signaling tones used. The buttons are labeled and positioned as a telephone dial would be. No "sidetones" are heard during this procedure.

7-8. Squelch

Turn the squelch knob counter clockwise until the rushing noise is heard and then clockwise until it just stops. This is the optimum squelch setting for the transceiver.

7-9. Error "E" Display on the LCD

Whenever an incorrect setting is made, an "E" will appear on the LCD. To restore operation, touch the [CLR] key and make the correct entry or slide switch setting.

7-10. NiCd Battery Pack

The NiCd battery pack contained in the transceiver can be cycled from full charge to full discharge 300 times or more with proper care. Overcharging of the pack however, will severely shorten the life while undercharging and under discharging will eventually cause the capacity of the pack to diminish. This is usually referred to as "memory". Cycling the battery at least once a month will prevent "memory".

If the "BATT" display on the LCD begins to flash on and off, the battery pack voltage has fallen below the lower limit of usable charge and should be fully recharged as soon as practical.

During this flashing, the radio may be operated for a few more transmissions. However, complete discharge of the battery is not recommended since it will require the reset of the memories and the clock.

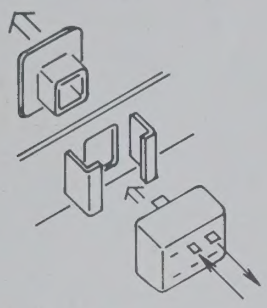
Quick charge of this pack is 150 mA maximum for 5 hours maximum or 100 mA for 6.5 hours up to 72 hours maximum. The maximum is the value recommended by the battery manufacturer. The charger supplied with the transceiver produces 45 mA of current which requires 15-17 hours charge time for full charge. It may, however, be left charging at this rate for an indefinite period of time.

NOTE: IN BATTERY PACK EXCHANGE, THE EXCHANGE SHOULD BE COMPLETED WITHIN 30 SECONDS. IF NOT DONE, IT IS POSSIBLE THAT ALL MEMORIES AND CLOCK TIME WILL REQUIRE RESET.

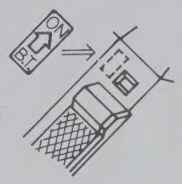
8. MOUNTING OF SUB TONE UNIT (SS-32)

1. Before mounting the sub tone unit, be sure to turn the power off; then remove the rear cover. (Here, the battery pack should be disconnected to prevent accidents.)
2. Unscrew two screws (marked with asterisk) from the battery section, then take out front panel.
3. Solder at the places indicated in the figure below.

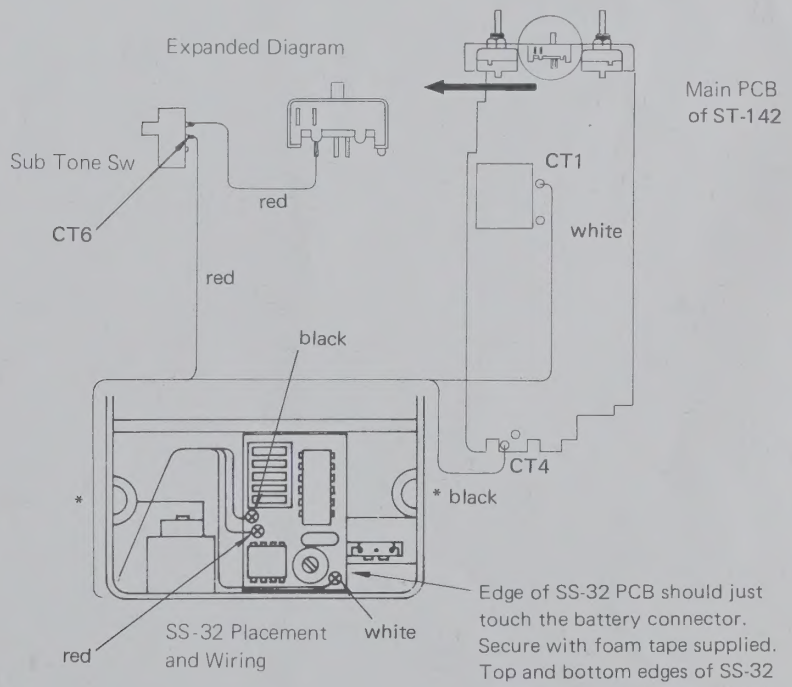
Remove the Plug



Install Switch in its place.

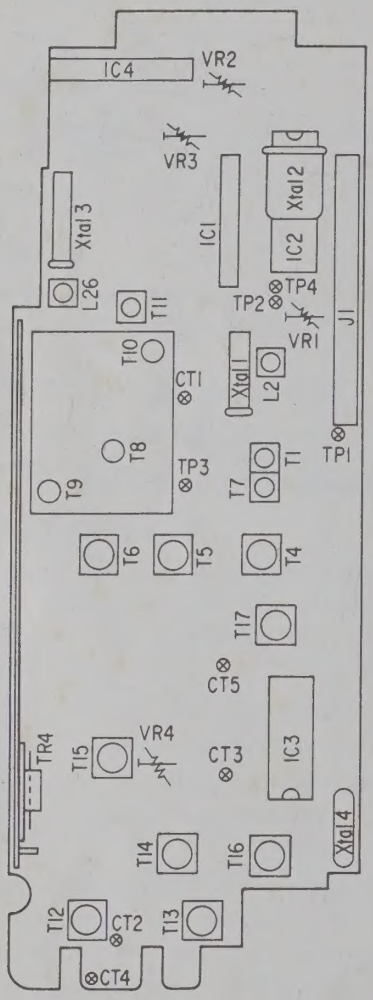


Place Label over the outside

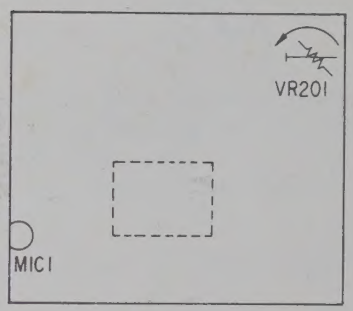


9. LOCATIONS OF INTERNAL CONTROLS

SANTEC MODEL ST-142 140 MHz
FM TRANSCEIVER



CONTROL BOARD
VR201: Touch Tone Output



TRX BOARD
- VR1: Deviation Control
- VR2: Medium Power Adjustment
- VR3: Mic Gain Control
- VR4: S Curve Detected Voltage Adjustment
- CT1: TX Tone Input
- CT2: Tone Squelch Power
- CT3: DC Squelch Switch (from decoder)
- CT4: Ground
- CT5: Demod. A.F. Output (to decoder)
- CT6: Sub Tone Encoder Power (switched)